

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

A communication from the Chief of Engineers of the Army, dated January 25, 1882, and accompanying copy of report from Maj. G. L. Gillespie, Corps of Engineers, upon an examination of the waters of New York Bay.

JANUARY 30, 1882.—Referred to the Committee on Commerce and ordered to be printed.

WAR DEPARTMENT,
Washington City, January 27, 1882.

The Secretary of War has the honor to transmit to the United States Senate, for the information of the Committee on Commerce, a communication from the Chief of Engineers of the Army, dated the 25th instant, and the accompanying copy of report from Maj. G. L. Gillespie, Corps of Engineers, upon an examination, made in compliance with requirements in the river and harbor act of March 3, 1881, of the waters of New York Bay, from a point between Ellis Island and the docks of the New Jersey Central Railroad to a point between Robbins' Reef Light and Constable Hook, New Jersey.

ROBERT T. LINCOLN,
Secretary of War.

The PRESIDENT *pro tempore*
of the United States Senate.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 25, 1882.

SIR: I have the honor to submit herewith a copy of a report to this office from Maj. G. L. Gillespie, Corps of Engineers, of the results of an examination made, in compliance with the requirements of the river and harbor act of March 3, 1881, of the waters of New York Bay from a point between Ellis Island and the docks of the New Jersey Central Railroad to a point between Robbins' Reef Light and Constable Hook, New Jersey.

Very respectfully, your obedient servant,
H. G. WRIGHT,
Chief of Engineers, Brig. and Brt. Maj. Gen.

Hon. ROBERT T. LINCOLN,
Secretary of War.

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SURVEY FROM A POINT BETWEEN ELLIS ISLAND AND THE DOCKS OF NEW JERSEY CENTRAL RAILROAD TO A POINT BETWEEN ROBBINS' REEF LIGHT AND CONSTABLE HOOK, IN WATERS OF NEW YORK BAY, NEW JERSEY.

UNITED STATES ENGINEER OFFICE,
New York, December 28, 1881.

GENERAL: In compliance with section 3, river and harbor act approved March 3, 1881, I have the honor to submit herewith my report on the examination "from a point between Ellis Island and docks of New Jersey Central Railroad to a point between Robbins' Reef Light and Constable Hook, in waters of New York Bay, New Jersey."

This examination was made under the direction of my predecessor, in July and August, 1881, and was conducted personally by Assistant Engineer A. Doerflinger, whose report accompanying this communication gives the outline of the projected improvement and the estimated cost.

The area covered by the examination is locally known as "Jersey Flats," which lie on the west side of the Upper Bay of New York, immediately south of Jersey City, extend to the entrance to Kill van Kull, and comprise 4,886 acres.

The Coast Survey chart of the Upper Bay, prepared in 1855, by comparison with that of 1835 shows that during the intervening twenty years the flats had moved greatly to the eastward, with an accompanying diminution in the depth of water. This shoaling is known to be due in part to the encroachments upon the river front by wharf constructions at Jersey City, and in part to deposits of dredgings taken from the slips in New York City. The shoalings from these sources caused the 20-foot curve between Ellis Island and the canal basin in Jersey City to advance 230 yards, and it has been estimated that the average daily deposit upon the flats was, during the interval stated, 1,500 cubic yards. The bed is composed generally of a deposit of mud, silt, sand, gravel, and bowlders, with an average depth of 6 feet water over it at low stage.

From Oyster Island to Craven's Point, on the Jersey shore, a wide shoal of rock in position underlies the bed; at many points the rock is visible at low-water, but generally lies at an average depth of 12 feet below that grade, with a varying covering of sand and silt, such as is found at other points of the flats. In the immediate vicinity of the small islands which lie adjacent to the main ship channel there are noticed small submerged areas of bowlders.

In 1872 the Coast Survey completed additional surveys to ascertain the extent of the continued shoals on the flats.

To form a comparison with the survey of 1855 a line was drawn from Robbins' Reef Light-House to Bedloe's Island flag-staff, and thence slightly deflected through Ellis Island flag-staff to the New Jersey Central Railroad wharf.

From these datum lines normals were laid off, and by the latter the changes in the 6, 12, 18 and 24 foot curves were noted. It was observed that all the curves had been pushed outwards or eastward, but most conspicuously the 24-foot curve near Ellis Island, which had moved on the average 303 feet, the maximum advance being 825 feet, reducing by so much the width of the main channel for heavy ships and increasing the shoal ground by 129 acres. The 18-foot curve had advanced in the average 211 feet, representing a shoaling of 92 acres, and at Oyster Island the 12-foot curve had advanced over 1,000 feet, due to careless and inju-

dicious dumpings there of city dredgings. It was estimated that the total deposits from 1855 to 1871 upon the *border of the main channel*, due to natural and artificial causes, reached the high figure of 3,000,000 cubic yards. Since 1871 dumpings of city dredgings upon the Jersey Flats have been prohibited by the Pilot Commissioners, and in consequence the shoalings arising from deposits due to natural causes have been so slight as to be almost inappreciable,² except on the outer edge of the flats. Later examinations, including the one to which this report refers, show that the flats, being under the lee of the long wharves at Jersey City, and sheltered from the currents which bring down deposits from the upper river, are not subject to further material shoalings, and that the present average and almost uniform depth of 6 feet over the general surface at low stage will be probably maintained indefinitely.

As the many railroads which concentrate at Jersey City now occupy all the best deep-water front in that city for their ferry slips, and for their own storehouses, elevators, and shipping wharves, the city feels sadly in need of a larger water-front to accommodate the commerce which naturally seeks that side of the harbor, and which now goes elsewhere to overcrowd the wharves in New York City and Brooklyn. To get a relief from this state of things it has been proposed to extend on the south side of Jersey City the exterior line of piers farther across the flats towards deep water, so that the property holders on the west shore line may render their water-fronts available for shipping purposes, and increase, by these improvements, the storage and shipping business of the harbor. The movement was commenced in 1864 by the Riparian Commissioners of the State of New Jersey establishing the exterior line of solid filling shown on the chart, 500 feet beyond which was placed the exterior line of piers. These lines follow generally the curvature of the shore. The promoters of the present examination now, desire that the government shall excavate a channel 300 feet wide, bottom measurement, and 21 feet deep at low-water, from the wharves of the Central Railroad of New Jersey in a straight line to the deep waters of Kill van Kull, the axis of the channel so excavated to be 670 feet to the eastward of the established exterior line of piers. Should the government undertake the opening of the communicating channel, the Riparian Commissioners agree to extend the exterior line for piers 500 feet beyond the line now adopted, which will then make the prospective piers and their intervening slips accessible to the deep-water channel, and open a shorter and more sheltered interior channel from the docks in Jersey and New York cities to those on Kill van Kull. Already have some of the property holders on the west shore commenced the excavation of channels across the flats to connect their wharves or slips near the present shore lines with the main channel of the bay. Two are shown upon the map; the first, that of Messrs. Morris & Cumings, starts near Pamrepa, and strikes the 12-foot curve midway between Robbins' Reef Light and Oyster Island. It is 8,400 feet long, 100 feet wide, and has 10 feet water at low stage. The second, in process of excavation, extends from Made Island to deep water, midway between Oyster Island and Bedloe's Island, part of it being excavated through the rocky area shown on the chart. It is probable that other channels, with the same object of utilizing the western shore, will be opened at an early day, but their limited width and depth must restrict their use at high-water to vessels drawing not exceeding 15 feet of water, and they will therefore not be able to afford all the relief that is desired.

The estimate which accompanies this report shows that the opening of the government channel, now so earnestly advocated by the property

holders on Bergen Neck, will be a work of great magnitude, and will cost the large sum of \$7,134,980. This estimate has been carefully revised, and is approximately correct. Although it is stated that the channel across the flats, opened at the expense of private individuals, has not shoaled since its excavation, it is not at all certain that the government channel once opened will be self-sustaining. The ebb and flood currents set directly across its projected axis, and it is to be expected that a slight degradation of the slopes of the cut in sand and silt will take place, and that a large percentage of the moveable material of the bottom adjacent to the improvement will gradually find its way into the deeper part. For this reason it is almost certain that dredging will be required at intervals to keep the channel free after it has been once opened. The projected channel will surely be of great benefit to any wharves which may be built out to it from the west shore, but it cannot be considered at all a complete, nor even an approximate, solution of the problem which is presented when the future application of the flats is considered. The time will come when this section will be examined with the view to its conversion into wet-basins, and if we heed the rapid growth of the city's commerce and wealth during the past twenty years, we may be impressed with the conviction that this conversion will not be long deferred.

The rapid development and increase of the commercial wealth of London, Liverpool, and other important seaports of the Old World following the establishment of wet-docks to facilitate trade and commerce, furnish prominent examples of what our own largest seaport may develop into when the shipping necessities of the harbor are once appreciated and suitable sums are devoted to the construction of improvements which will extend the field of its commercial greatness by giving not only piers for handling produce entering into immediate consumption, but by giving facilities for housing that designed for exportation.

It is inopportune now to consider the conditions under which this conversion should take place, or to divide by exact lines the water spaces to be reserved; but any adopted plan should be based upon the principle of preserving, as far as possible, the tidal reservoir of the flats which equals 30,000,000 cubic yards approximately. Neglecting at this time, then, all reference to an improvement which contemplates the construction of wet-docks, it will be stated that the immediate effect of opening a channel 300 feet wide from the north to the south end of the flats will be, first, to diminish in a moderate degree the sailing distance between the New York City wharves and the waters of Kill van Kull, and to give a better protected interior channel for the shipping between those points; and, second, to diminish in the average by 3,700 feet the length of piers, or piers and channels, connecting the west shore line with the deep-water channel to enable that portion of the water front to be utilized to an equal extent with other parts of the bay. As the flats are quite shoal, well sheltered from river currents, and have their eastern edge precipitous and bold, it is believed that the building of piers and docks across them will not disadvantageously effect the present currents of the main channel and that these improvements may be made without conflicting with any interest involving the security and preservation of the navigation of the Upper Bay or of any of its approaches.

Jersey Flats are in the collection districts of New York and Newark, N. J., which are the nearest ports of entry. The nearest fort is at the Narrows, and the nearest light-house on Robbins' Reef, Upper Bay, New York Harbor.

The amount of revenue collected at the port of New York, for the year ending June 30, 1851, was \$139,579,562.83.

The amount collected for the same period at Newark, N. J., was \$9,327.06.

Number of vessels permanently documented at Newark for the coasting trade is 28 sail and 30 steamers, with an aggregate tonnage of 5,402 tons. Vessels entered from foreign ports, 49; vessels cleared for foreign ports, 10.

The proportion of commerce represented by the foregoing figures which will be benefited by the improvement cannot be given approximately. It has been estimated as high as \$10,000,000 annually.

I am, general, very respectfully, your obedient servant,

G. L. GILLESPIE,

Major of Engineers, Bvt. Lieut. Col., U. S. A.

Brig. Gen. H. G. WRIGHT,
Chief of Engineers, U. S. A.

REPORT OF MR. A. DOERFLINGER, ASSISTANT ENGINEER.

NEW YORK, December, 12, 1881.

MAJOR: I have respectfully to submit the following report on the examination of New Jersey Flats, made with the view of determining the feasibility and cost of constructing a ship-canal extending "from a point between Ellis Island and the docks of the Central Railroad of New Jersey to a point between Constable Hook and Robbins' Reef Light, New York Harbor."

The field work of the survey was executed between July 10 and August 23, 1881, under instructions from the late Lieut. Col. N. Michler, Corps of Engineers, Brevet Brigadier-General, United States Army, and was confined principally to make borings in order to determine the character and extent of a ledge of rock underlying the flats off Craven's Point.

The soundings on the chart submitted herewith are taken principally from a United States Coast Survey chart, based on resurveys made in 1871, 1872, and 1873. In connection with the borings, however, soundings were also taken in the present examination, and compared with those of the United States Coast Survey; no material difference was found to exist between the present soundings and those of 1871, 1872, and 1873, from which it appears that no marked change in the depth of water over the portion of the flats examined has taken place since the date of the earlier survey.

The total number of borings made is 328, of which only those most characteristic are shown on the map; they were made with a well-pointed iron rod, which could be lengthened at will by the addition of 10-foot sections. This rod was churned down from a platform framed across two row-boats by the united efforts of two men, until rock or other impenetrable strata was reached: the rod was withdrawn by means of a simple windlass arranged for the purpose on the platform. The position of each boring was located by sextant observations. From this investigation it was found that the material composing the upper stratum of the flats is principally mud, soft on top, becoming more or less stiff and harder with depth. A ledge of rock was found to extend out from Craven's Point to the main ship-channel. The higher portions of this ledge come to the surface at several points on a line drawn from Craven's Point to the southerly end of Oyster Island, which latter is one of the summits of the ledge. Outercopings of the rock, which consists of gneiss nearly vertically stratified, the strata running in a northeasterly direction, are also found on the mainland at Craven's Point. Sand, shells, and gravel, and mixtures of the latter, from the more immediate covering of the rock, accumulations of boulders of various sizes, some of which are dry at low-water, were found at the points where the rock comes to the surface. Immediately north of the ledge, for a distance of about 2,000 feet, soft mud was found to a depth of 22 to 23 feet below low-water; from this point to the docks of the Central Railroad hard sand was found a short distance below the surface. To the south of the ledge mud was generally found to a depth of 18 to 21 feet, below which, in most instances, sand and clay was reached. To determine the velocity and direction of the tidal drift, current observations were made off Craven's Point, and also between Ellis Island and the docks of the Central Railroad. The observations at each station were continued during the greater part of one tide. On the chart the direction and velocity of maximum current only is indicated.

During the period covered by the observations, about 4 hours on each tide, but little change in the direction of the current was observed, with the exception of the flood current at the last-mentioned station, the direction of which during maximum velocity was found to bear 10° further north than during the first and last stages of the tide.

Between Ellis Island and the docks of the Central Railroad maximum ebb current occurs about 4 hours after the preceding high-water, and maximum flood about 4 hours after the preceding low-water.

Off Craven's Point maximum flood current happens about 4 hours after preceding low-water, and maximum ebb 3 hours after preceding high-water.

From observations on the currents in the Hudson River, between Bedloe's Island and Castle Point, made under the direction of Col. John Newton, Corps of Engineers, in 1874, it was found that "the occurrence of maximum discharge of the river takes place about 14 hours 19 minutes after moon's transit"; and also that "the swiftest flood currents happen about 8 hours 22 minutes after moon's southing". (Report of the Chief of Engineers, 1875, page 217, part 2.)

At the "Idle Hour" dock the mean interval of high-water after preceding moon's transit is 8 hours 1 minute, and mean duration of fall of tide 6 hours 32 minutes; from which it appears that maximum ebb in the Hudson River happens 6 hours 18 minutes after high-water, or about 2 hours 18 minutes after the occurrence of maximum ebb on the flats near Ellis Island, and 3 hours 18 minutes later than off Craven's Point; and likewise that maximum flood in the Hudson River occurs about 2 hours 28 minutes later than at both current stations on the flats.

To obtain access to the deep water of New York Harbor it is the desire of the owners of the lands bordering on the flats, and of others interested in the utilization of the flats for the purposes of trade and commerce, that a ship-channel be constructed about 500 feet outside of the pier line as at present established from the docks of the Central Railroad to Craven's Point, the channel to continue in a straight line to the deep water of Kill van Kull. The Riparian Commissioners of the State of New Jersey propose, should the construction of the channel be undertaken by the United States Government, to establish a new pier line to coincide with the westerly limits of this channel so that the future pier heads will thus be accessible from the navigable waters of the bay. In addition to affording a means of deep-water communication between future piers that may be built on the flats in the navigable waters of the harbor, the channel would somewhat shorten the distance from points on the Hudson River to points on Kill van Kull, and would afford a more sheltered water-way to the numerous tugs now plying between these points, and one more free from strong head currents than the main ship-channel.

The proposed channel is shown on the chart. The depth of the projected cut has been assumed at 21 feet at mean low-water, with a bottom width of 300 feet, and slopes of 1 upon 1 in earth, the sides of the cut through rock to be nearly vertical. The quantity of excavation has been calculated from the soundings and borings. The rock cutting should be regarded as approximate only, since a more detailed survey than it was possible to make with the funds available for the present examination would be necessary to determine this amount with a greater degree of accuracy. It will be seen by an inspection of the chart that both the ebb and flood currents do not run in the direction of the proposed cut, but make an angle of about 22 degrees with the same. It is probable, however, that the effect of the channel, should the same be excavated, would be to somewhat modify the present currents on the flats, so that on the completion of the work the direction of the tidal drift would become more nearly coincident with that of the channel, and the currents, by their scouring action, tend to keep the channel open; especially would this result be likely to follow should piers be built from the main land out to the line of the channel. Still, in all probability, more or less silting up would take place by the washing in of the banks of the cut, at least in those portions where the cutting is through soft mud, as is the case directly north of the ledge of rock, so that dredging would likely become necessary from time to time in order to maintain a depth of 21 feet in the channel.

The estimated cost of the proposed channel is herewith respectfully submitted. The cost of \$12 per cubic yard for rock excavation is based on the supposition that the work will be done in the ordinary way of drilling from the surface, breaking the rock up by blasting, and removing the fragments by means of a dredge. It is believed, however, that should appropriations be made sufficiently large to warrant the adoption of a comprehensive plan of operations the greater portion of the rock could be removed at a much less cost by inclosing the area to be operated on with a coffer-dam, and carrying on the excavation in open cut.

ESTIMATE OF COST.

458,333 cubic yards rock excavation, at \$12 per yard.....	\$5,499,996
3,945,400 cubic yards dredging, at 25 cents per yard.....	986,350
Engineering, contingencies, &c.....	648,634

Total.....	7,134,980
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I am, very respectfully, your obedient servant,

A. DOERFLINGER,
Assistant Engineer,

Maj. G. L. GILLESPIE,
Corps of Engineers, Brt. Lieut. Col., U. S. A.



CHART OF
AN EXAMINATION OF NEW JERSEY FLATS
FROM DOCKS OF CENT. R. R. OF N. J. TO CONSTABLES POINT

drawn under the direction of

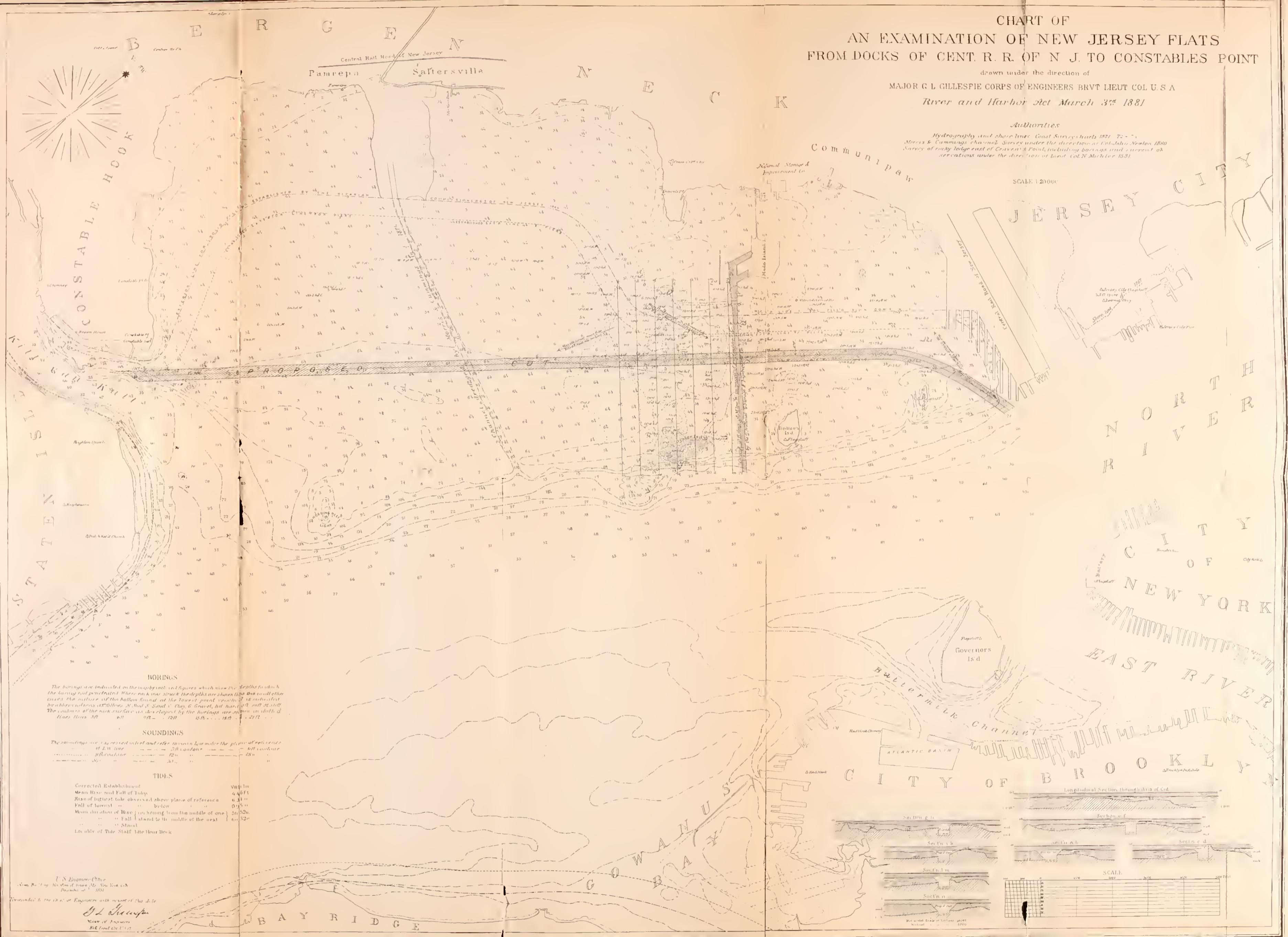
MAJOR G. L. GILLESPIE CORPS OF ENGINEERS BREV. LIEUT. COL. U. S. A.

River and Harbor Act March 3rd 1881

Authorities

Hydrography and shore lines. Coast Survey Charts 1871-72-73.
Moses & Cummings channel Survey under the direction of Col. Jas. Norton 1880.
Survey of rocky ledge east of Cravent's Point, including borings and current ob-
servations under the direction of Lieut. Col. N. McWhirter 1881.

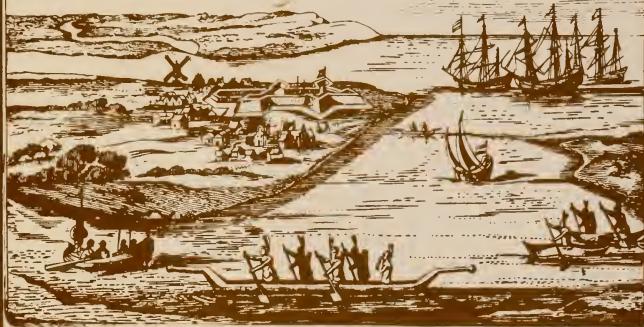
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